Particle Analysis and Display System (PADS):

Cloud Combination Probe (CCP) Summary Module

Operator Manual

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PADS 2.5.6, CCP Module 2.5.3

DROPLET MEASUREMENT TECHNOLOGIES

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C O N T E N T S

L i s t   o f   F i g u r e s

1.0 Introduction

The Particle Analysis and Display System (PADS) is a software package that interfaces with all the instruments produced by Droplet Measurement Technologies (DMT) and other leading instruments used in the atmospheric sciences. This manual describes the PADS module for the Cloud Combination Probe (CCP) summary display, which allows you to view and analyze data from the CCP component instruments simultaneously.

For an explanation of the basic PADS setup and instructions on how to acquire data using PADS, consult the *PADS Operator Manual*. The *Operator Manual* also gives definitions for all the channels that the CCP Summary displays.

2.0 Configuration

While the CCP is a summary rather than an instrument, you can still configure its setup. The following section describes in detail how to do this. The next section explains how to configure the CCP display in PADS so that it shows you data in the desired formats.

Configuring the CCP Summary

To configure the CCP summary setup, follow the steps below. *Note: Droplet Measurement Technologies STRONGLY recommends customers contact our office prior to changing any of the parameters in the instrument configuration. Improper changes can result in communication failure and/or changes in PADS computation algorithms, which can compromise data validity.*

1. Click on the "CCP Summary" tab.

2. From the **Configure** menu, select **Configure Instrument.** You will see the following window.
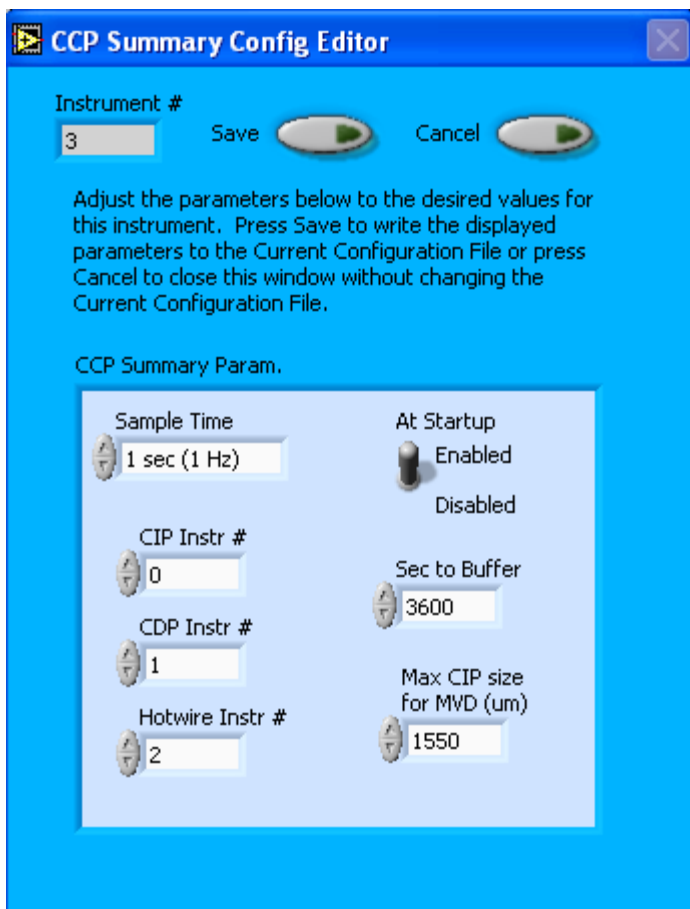
Figure 1: CCP Configuration Editor Window

3. Now you can configure the instrument parameters to your desired specifications. You will find a list of the parameters you may want to reconfigure in the two sections below, "Occasionally Reconfigured CCP summary Parameters" and "Rarely Reconfigured CCP summary Parameters." If at any time you would like to revert to the previously saved values for the CCP summary parameters, press **Cancel** to exit the window without saving changes.

4. When you are done configuring the CCP summary parameters, press **Save** at the top of the Config editor window. (If you would instead like to revert to the previously saved values, click **Cancel**.) Then press the green **Reset Program** button for the new configuration to take effect. Note that pressing the **Reset Program** button will clear any data currently being displayed.

Occasionally Reconfigured CCP summary Parameters

Sample Time: This parameter shows the time interval at which the CCP summary collects data from its component instruments. You can have the probe sample at intervals of .1, .2,

.5, 1, 2, 5, or 10 seconds (10, 5, 2, 1, 0.5 or 0.1 Hz). It is recommended that you set **Sample Time** to the fastest sample time among the component instruments, so that no data are lost. If the component instruments have different sample times and the CCP summary sample rate is faster than that of the slower instruments, the CCP will simply read the latest available data.

At Startup Enabled / Disabled: If you want the CCP summary to acquire data when PADS begins sampling, make sure this parameter is in the "Enabled" mode. In some cases, such as if one or more of the CCP component instruments is inoperative, you may want to use this control to disable the CCP summary. Doing so allows data to transmit from other instruments without interference.

Sec to Buffer: The number of seconds that PADS stores data acquired by the CCP summary in its memory. One hour has been chosen as the default setting because this is the maximum length of time that data can be stored without taxing computer memory.

Max Size for CIP MVD: The maximum diameter that a CIP-detected particle can have and still be included in the CCP summary's calculations for CIP MVD, CIP ED, CIP LWC and CIP # Conc. Particles exceeding this maximum size are still included in calculations displayed on the CIP display screen and in the CIP output file, but they are omitted from CCP summary calculations. As a result, the CIP MVD displayed on the CIP tab, for instance, may differ from CIP MVD displayed on the CCP summary tab. Setting a maximum size for CIP MVD allows you to omit large outliers such as raindrops, which can dramatically alter the results of these calculations.

You will notice that there are other parameters listed on the **CCP Summary Config Editor** window. You should not need to change these, and changing them may compromise your data. If you are curious about these parameters or think you do need to modify them, see the section titled "Rarely Reconfigured CCP Summary Parameters" below or consult with a DMT technical representative.

Rarely Reconfigured CCP Summary Parameters

The CCP Summary configuration editor displays several parameters that you will rarely need to modify. The following is a list of these parameters and an explanation of what they do.

Instrument #:   This lists the number corresponding to the instrument you are viewing, in this case the CCP summary. If your CCP summary has been assigned instrument number one, you will see "1" in this field. You should not need to modify the instrument number, and in fact you are unable to do so from within PADS.

CIP Instr #:   The instrument number that has been assigned to the CIP. This number should match the **Instrument #** on the Config Editor screen for the CIP.

CDP Instr #:   The instrument number that has been assigned to the CDP. This number should match the **Instrument #** on the Config Editor screen for the CDP.

Hotwire Instr #:   The instrument number that has been assigned to the Hotwire LWC. This number should match the **Instrument #** on the Config Editor screen for the Hotwire_LWC.

After making changes in the instrument configuration window, you will need to press the **Save** button and then click the green **Reset Program** to activate these changes. Clicking **Reset Program** will clear any data PADS is currently displaying.

Configuring the CCP Summary Display

To configure the CCP Summary display, click on the CCP tab if you have not already done so. Then select **Configure** from the menu bar and click on **Configure Display.** This will bring up the following window.

To configure the CCP Summary display, follow the steps below.

1. Click on the "CCP Summary" tab.

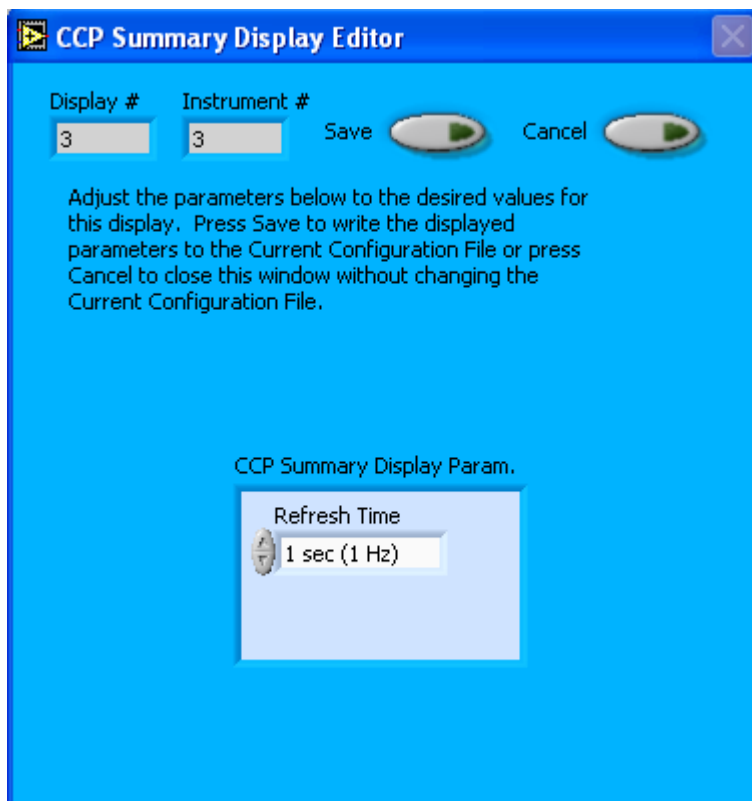2. From the **Configure** menu, select **Configure Display.** You will see the following window.

Figure 2: CCP Summary Display Editor Window

You do not need to modify the **Display #** or **Instrument #**. Changing the **Refresh Time** allows you to set the time intervals for data display during acquisition mode; you can choose any time that is equal to or greater than the sample time. (Choosing a time less than the sample time is not useful, since the same data will be displayed multiple times.)

When you are done, click on **Save** to update the configurations or **Cancel** to revert to the previous configuration. After you reset PADS, you will be able to see any changes you have made to Refresh Time. Note that clicking **Reset Program** will clear out any data currently being displayed.

3.0 The CCP Summary Window

The CCP window consists of channel tabs, a total MVD chart, and CIP and CDP particle counter charts. These are discussed below. For explanations of the **Enable** button and **Fault/No Fault** button, see the "Instrument Tabs" section of the *PADS Operator Manual*. The **Max CIP size for MVD (μm)** control allows you to change the maximum diameter for CIP-detected particles included in several calculations. For details, see **Max Size for CIP MVD** under the section "Occasionally Reconfigured CCP Parameters." The default for this field is the value stipulated in the CCP Summary Config Editor screen. You can change this default by pressing on the arrows or by typing a new value directly into the field.

Channel Tabs

In the top left of the CCP screen are the channel tabs. The first tab, **CCP Main Parameters**, displays key channels collected from the three CCP Summary instruments—CIP, CDP and Hotwire LWC. This tab is shown in Figure 3. The second tab, **CCP Diagnostics**, displays channels that indicate whether the instruments are functioning properly.
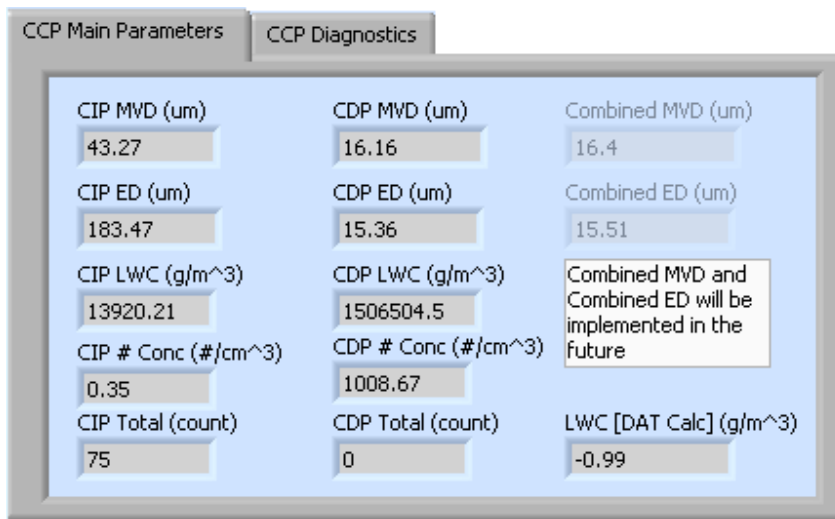

Figure 3: CCP Main Parameters Tab

For information on specific channels, their definitions, and their acceptable ranges, consult *PADS Operator Manual*'s *Appendix A: Definitions*.

Total MVD Chart Display

To the right of the tabular channel data is a chart of the total MVD for the CIP and CDP. Currently the CCP Summary does not calculate total MVD, so the graph does not display any data. In the future, however, the program will calculate and chart this channel. *Note:* If you are reading a data file generated by an older version of the PADS CCP Summary module, you may also see values for Total MVD.

CDP and CIP Particle Counters

In the bottom half of the CCP Summary window are the CDP and CIP particle counters. These display a particle-size histogram for each instrument based on the current moment in time.

On both charts, you can change the scale by typing a different number into the starting and ending values on each axis. For instance, if you wanted to change Figure 4's maximum displayed particle size to 10, you would simply select the field that currently says 100 and type in 10. In acquisition mode, you should disable autoscaling (see below) before you modify fields in this way.
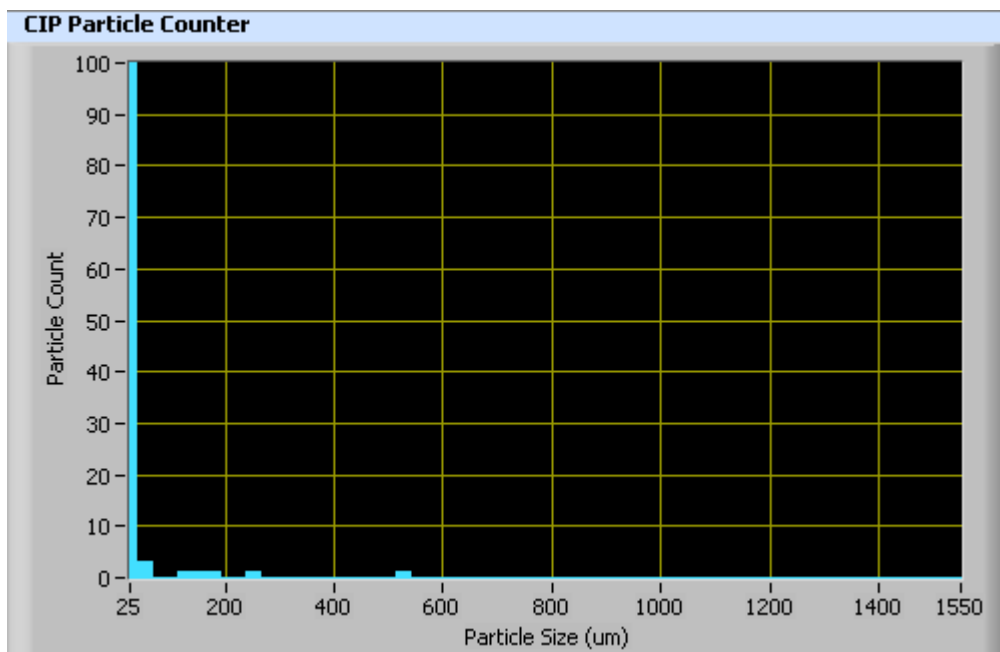

Figure 4: CIP Particle Counter

The charts also show you options for scaling and copying the data when you right-click on them, which brings up a drop-down menu. These options are as follows:

Autoscale   This autoscales the relevant axis. In autoscaling mode, the minimum and maximum values of the axis are set automatically so that all data points can be seen in the display. Note that on charts that have autoscale buttons, like the large histogram chart on some instrument tabs, the buttons override the Autoscale options in the drop-down menu. To see autoscaling options in the drop-down menu, position the cursor over the relevant axis before right-clicking. Note that you may not always be able to autoscale the x-axis.

Copy Data   This copies the chart to the clipboard using a screen capture. This chart can then be pasted into other documents like Word or PowerPoint presentations.

Export Simplified Image   This copies a simplified image of the data to the clipboard or an output file. You can choose the format you desire—bitmap (.bmp), encapsulated postscript (.eps), or enhanced metafile (.emf). Note that when you select the .eps option, you must copy the data to a file. Unless you specify otherwise, output files will be saved in the time-and-date-specific output file directory for the current session.

Clear Graph   This erases the currently displayed data points from the graph.

Appendix A: CCP Summary Channels

A complete list of CCP Summary data channels appears below. The CCP output file will contain data values for each channel for each sampling instance.

For definitions of the channels, see *Appendix A* in the *PADS Operator Manual*.

Time	CDP_Bin_4	CIP Bin 7
CDP MVD (um)	CDP_Bin_5	CIP Bin 8
CDP ED (um)	CDP_Bin_6	CIP Bin 9
CIP MVD(um)	CDP_Bin_7	CIP Bin 10
CIP ED (um)	CDP_Bin_8	CIP Bin 11
Total MVD (um)	CDP_Bin_9	CIP Bin 12
Total ED (um)	CDP_Bin_10	CIP Bin 13
LWC Hotwire (g/m^3)	CDP_Bin_11	CIP Bin 14
CDP LWC (g/m^3)	CDP_Bin_12	CIP Bin 15
CIP LWC (g/m^3)	CDP_Bin_13	CIP Bin 16
Airspeed (m/s)	CDP_Bin_14	CIP Bin 17
CDP Total Count	CDP_Bin_15	CIP Bin 18
CDP # Conc	CDP_Bin_16	CIP Bin 19
CDP Laser Temp (C)	CDP_Bin_17	CIP Bin 20
CDP Laser Curr (mA)	CDP_Bin_18	CIP Bin 21
CDP Laser Monitor	CDP_Bin_19	CIP Bin 22
CIP Total Particles	CDP_Bin_20	CIP Bin 23
CIP # Conc	CDP_Bin_21	CIP Bin 24
CIP Max Size for MVD	CDP_Bin_22	CIP Bin 25
CIP End Diode Rej	CDP_Bin_23	CIP Bin 26
CIP Over Range	CDP_Bin_24	CIP Bin 27
CIP Ambient Temp (C)	CDP_Bin_25	CIP Bin 28
CIP Diode Voltage 1	CDP_Bin_26	CIP Bin 29
CIP Diode Voltage 32	CDP_Bin_27	CIP Bin 30
CIP Diode Voltage 64	CDP_Bin_28	CIP Bin 31
CIP Laser Curr (mA)	CDP_Bin_29	CIP Bin 32
Hotwire LWC (V)	CDP_Bin_30	CIP Bin 33
LWC Slave (V)	CIP Bin 1	CIP Bin 34
Static Pressure (mb)	CIP Bin 2	CIP Bin 35
Pitot Pressure (mb)	CIP Bin 3	CIP Bin 36
CDP_Bin_1	CIP Bin 4	CIP Bin 37
CDP_Bin_2	CIP Bin 5	CIP Bin 38
CDP_Bin_3	CIP Bin 6	CIP Bin 39

CIP Bin 40	CIP Bin 48	CIP Bin 56
CIP Bin 41	CIP Bin 49	CIP Bin 57
CIP Bin 42	CIP Bin 50	CIP Bin 58
CIP Bin 43	CIP Bin 51	CIP Bin 59
CIP Bin 44	CIP Bin 52	CIP Bin 60
CIP Bin 45	CIP Bin 53	CIP Bin 61
CIP Bin 46	CIP Bin 54	CIP Bin 62
CIP Bin 47	CIP Bin 55	Status
		GPS Time

CCP Summary channels fall into several broad categories:

Time Channels: Time and GPS Time store time data. Time is generated by the PADS computer clock and is the time when the program receives the CIP data. GPS Time is included in every instrument's list of channels whenever a GPS is included as one of the PADS instruments.

Bin Channels: Channels labeled CDP_Bin_[*i*] and CIP Bin [*i*] store data on the number of particles of different sizes that the two probes have detected. These data are used in the particle-count histograms in the bottom half of the CCP tab.

Channels for Other Statistical Data: CIP End Diode Reject, CIP Over Range, CIP Total Particles and CDP Total Count store particle statistics collected by the probes. Status stores statistical data the CCP has gathered on the communication between itself and PADS.

Housekeeping Channels: Housekeeping channels are denoted by italics in the channels list above. CIP housekeeping channels are generated by a 12-bit A/D converter that converts a 0-10 V range to binary values from 0 to 4095. On the CDP, the input voltage range is 0-5 V.

Calculated Channels: Channels labeled ED, MVD, LWC, and Conc store the results of calculations PADS has performed on particle data. Airspeed stores the true air speed collected by the master TAS source designated on the PADS Setup screen.

Parameter Channel: CIP Max Size for MVD stores the setting for this instrument configuration parameter at the time of the sampling instance.

Global Channel: Airspeed holds the probe air speed generated by the master source designated on the PADS Setup screen. Note that probe air speed can differ from TAS by up to 20%.